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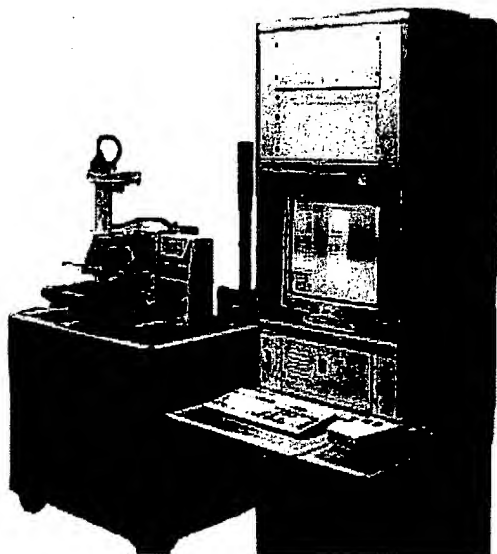
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Preliminary Version

LEICA LWM 250 DUV

**Specifications and
Acceptance Tests
for the
Line Width Measurement
System**

January 08, 2001

Leica



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Design and specification subject to alteration without
notice

Order no. of this edition:

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System Information

System: _____

Order no.: _____

Serial no.: _____

Manufacturer: _____

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35530 Wetzlar
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Certification of factory acceptance

The system named above with its modular assemblies has been inspected with regard to the specifications in the enclosure and left the factory in a perfect condition.

Date: _____

Tested by: _____

Certification of installation and start-up

System start-up was carried out by TS-MEL resp. Sales Company: _____

Customer: _____

Dept.: _____

Tel.: _____

Address: _____

User: _____

The system named above was installed and put into operation. The specifications in the enclosure have been proved.

Date: _____

TS-MEL/Sales Company: _____

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Certification of customer acceptance

The system has been delivered completely according to the delivery note. All acceptance test procedures were carried out and the results were:

fully ☐
partly ☐
not ☐
in tolerances

Deviations: _____

The system is finally accepted:

Date: _____ Customer: _____

The system was not accepted due to the following reasons: _____

Date: _____ Customer: _____

Beginning of warranty

The beginning of the warranty period is herewith confirmed:

Date: _____

TS-MEL/Sales Company: _____ Customer: _____

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System Configuration

Leica Order no. : _____ Serial no.: _____

Cust mer ID : _____

Hardware

Microscope : Type: _____ # no.: _____

Objectives : Pos.1: _____ Pos.2: _____ Pos.3: _____

: Pos.4: _____ Pos.5: _____ Pos.6: _____

Opt. accessories : _____

O- tube : Type: _____ # no.: _____

Sliding mask holder: Type: _____ # no.: _____

Loading system

Mask holder : Type 1: _____ Type 2: _____ Type 3: _____

: Type 4: _____ Type 5: _____ Type 6: _____

LFS-module : Type: _____ # no.: _____

Beam splitter : Type: _____ # no.: _____

Lamphouse, vis. : Type: _____ # no.: _____

Lamphouse, DUV: Type: _____ # no.: _____

Notch filter : Type: _____ # no.: _____

Hg/Xe supply : Type: _____ # no.: _____

Mot. condensor : Type: _____ # no.: _____

Measuring cam. : Type: _____ # no.: _____

Alpha unit : Type: _____ # no.: _____

Scanning stage : Type: _____ # no.: _____

Stage controller : Type: _____ # no.: _____

X/Y/Z Box : Type: _____ # no.: _____

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Computer and accessories

Measurement controller: Type: _____ # no.: _____

Operating system

DOS ver.: _____ Win ver.: _____

Mother board: _____ Memory: _____

Bios ver.: _____ Date: _____

HD-type: _____

Cyl. : _____ Head : _____ WPcom : _____
L-Zone : _____ Sect. : _____ Size : _____ Mode: _____Floppy: ☐ CD-ROM: ☐ Zip drive: ☐

Keyboard no. : Type: _____ # no.: _____

Mouse/Track ball : Type: _____ # no.: _____

Monitor : Type: _____ # no.: _____

Printer : Type: _____ # no.: _____

NT-Workstation-PC: Type: _____ # no.: _____

Operating system

DOS ver.: _____ Win ver.: _____

Mother board: _____ Memory: _____

Bios ver.: _____ Date: _____

HD-type: _____

Cyl. : _____ Head : _____ WPcom : _____
L-Zone : _____ Sect. : _____ Size : _____ Mode: _____Floppy: ☐ CD-ROM: ☐ Zip drive: ☐

Keyboard no. : Type: _____ # no.: _____

Monitor : Type: _____ # no.: _____

Media Controller : Type: _____ # no.: _____

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Software

Leica **LWM250DUV** Software, Measurement-Controller
Application software

Version: _____ Date: _____

Leica **LWM250DUV** Software, NT-Controller
NT-terminal software

Version: _____ Date: _____

Firmware/Eproms in System

Microscope:

Master : _____

Basic : _____

LZAM : _____

ICR : _____

Stage controller : _____

Consumable parts

The parts listed below are consumable parts with the indicated lifetime (operation conditions 24hrs, 7days/week).

Part	Lifetime approx.	Order no.
Halogen lamp 12V/100W	>=4 weeks	11 700 066
HBO/XBO lamp 100W Hamamatsu L8029 Mercury/Xenon	>=6 weeks	11 700 075
Ushio UXM-S100ZS	>=6 weeks	11 700 076

The lamps can be ordered as usual via Leica's TS-Logistic, Wetzlar.

Documentation

The following documentation will be supplied with every system:

Documentation	Quantity
LWM Operation Manual	<input type="checkbox"/>
Windows Operation Manual	<input type="checkbox"/>
Hardware Manual <i>LWM 250 DUV</i>	<input type="checkbox"/>
Software Manual	<input type="checkbox"/>
Computer Manuals	<input type="checkbox"/>

Service manual will be supplied in combination with service training only.

Safety notes

Electrical safety

A safety test according to EN 61010-1 has been carried out for each component connected to the mains and for the entire system. All requirements of the safety test were met.

Electromagnetic Compatibility

The electromagnetic compatibility of the system is in accordance with EN 50081-2, EN 50082-2.

Laser safety

The instrument is a Class I Laser product in accordance with the following regulations:

IEC825-1 : 1993

EN 60825-1 :1994

VBG 93 (1988, BRD)

21 CFR 1040 (1985, USA)

Technical data

This section contains information on specifications of the system.

Data in part **"Specifications to be demonstrated"** are demonstrated with the test procedures in the section

"Test and Acceptance procedures".

Data in part **"Certified specifications"** are certified with this data sheet.

Data mentioned as **"Typical performance"** have been obtained on customer masks during evaluation. Guaranteed specifications on customer masks can be supplied only after sample evaluation by Leica Microsystems Wetzlar.

The following is a list of Leica test standards, techniques and external data sheets:

- SEMI standards: SEMI M1.10-92, M15-89, M1.6-89, M1.7-89, M1.8-89, M1.9-91, M1.10-92, M1.11-90, M1.12-90, M1.13-90
- Admissible floor vibration spectrum
- Leica CD testmask

All information is based on the measurement and analysis parameters of section **Test and Acceptance Procedures**.

Specifications to be demonstrated

Measuring system LWM

- **DUV-Line long term repeatability:**
3 sigma; $\leq 3\text{nm}$ on Leica CD testmask (structures lines/spaces $0.3\mu\text{m} \dots 4.6\mu\text{m}$)

The test procedures are described on page B-16.

Certified specifications**Measuring system LWM 250 DUV****Basic specifications**

	DUV measurement
Screen X/Y measurement area (objective 150x)	10µm x 7,5µm
Screen linearity (objective 150x)	<=10nm
Measuring time manual mode (typical performance)	<=5s
Measuring time automatic mode (typical performance)	<=15s

Typical performance

Data mentioned under this paragraph ("**Typical performance**") have been obtained on customer masks during evaluation. Guaranteed specifications on customer masks can be supplied only after sample evaluation by Leica Microsystems Wetzlar!

Minimum line width	DUV measurement
Minimum line width w/o pellicle ASI (transmitted light)	0.2µm
Minimum line width with pellicle ASI, transmitted light	n.a.
Minimum AEI line width transmitted light	0.2µm

Chrome/Glass masks	DUV measurement line widths of 0.3-4.6µm
Short term repeatability AEI transmitted light	t. b. d.
Short term repeatability ASI transmitted light, excellent edge quality, typical performance	3nm (3 sigma)
Long term repeatability AEI transmitted light	t. b. d.
Long term repeatability ASI transmitted light, excellent edge quality, typical performance	3nm (3 sigma)

Pelliclized chrome/glass masks	DUV measurement
Short term repeatability pelliclized ASI transmitted light, excellent edge quality, typical performance	n. a.
Long term repeatability pelliclized ASI transmitted light, excellent edge quality, typical performance	n. a.

Half tone phase shift masks	DUV measurement line widths of 0.3-10µm
Short term repeatability HT PSM ASI transmitted light, excellent edge quality, typical performance	t. b. d.
Long term repeatability HT PSM ASI transmitted light, excellent edge quality, typical performance	t. b. d.

Safety data:

- Ground conductor resistance = < 0.1 Ohm
- Insulation resistance = > 10 MOhm
- High-voltage test = < 1.2 kV

Reliability data:

- MTBF* = > 1000h** (***)
- MTTR* = < 4h**

* = according to SEMI GUIDELINE EQUIPMENT RELIABILITY E10-92

** = can only be guaranteed by the local LEICA Agency.

*** = except light bulbs, high pressure lamps and other consumables.

Clean room class compatibility: = < 10

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Microscope

Objective nos piece:	=	<1s, time required to switch an objective to adjacent position sixfold objective nosepiece with 4 centerable objective positions.
Focus drive:	=	motorized with 18nm resolution
Aperture diaphragm: Reflected light only	=	motorized 5 pos. diaphragm revolver automatically matched to objectives used
Field diaphragm: Reflected light only	=	motorized, automatically matched to illumination mode used
Autofocus:	=	Laser Autofocus (LFS) - Wavelength of laser diode: <u>904nm</u> - Focusing with objectives 5x, 10x, 20x, 40x, 50x, 100x, 150x, on materials with 1%...96% reflection
Optical Resolution :		better than 0.2 μm line width using adequate high performance objective (high magnification, high aperture) on a grid structure.

Scanning stage (preliminary)**Scanning stage for sample size: 6"**

- Stage position repeatability:	<3 μm (3s)
- Stage accuracy	<4 μm (3s)
- Travel range	152 mm x 152 mm (incident light mode)
- Planarity of sample holder	<30 μm
- Maximum speed	> 50 mm/s
- Maximum stage load	= 2kg (incl. sample holder)
- Resolution	= 0.5 μm
- Max. sample thickness	<29mm (without sample holder)
- Orthogonality	22 μm /150mm

Tests and acceptance procedures

Test conditions

- Operating temperature 18°C - 25°C (64°F-77°F)
- Measuring temperature 22°C (72°F, +/-2°F)
- Temperature stability +/- 0.5°C
- Relative humidity =<75%, +/-1%
- Proper installation and adjustment by authorized personnel
- Minimum operating time 24h
- Hard/software calibrations are carried out accurately
- Floor vibrations as per admissible vibration spectrum
- Vacuum supply <200hPa
- Airpressure: Pmin=5bar; Pmax=10bar
- Power supply: 115 / 230 Volt , +/- 10% , 50/60 Hz

Test procedures

Measuring system LWM

- DUV long term repeatability:

The following macros have to be used:

ACCX_DUV.MAC ;CD measurement in X-direction

ACCY_DUV.MAC ;CD measurement in Y-direction

1. The test is related to the Leica CD testmask which is delivered with the system.
2. The acceptance test is repeated 3 times during at least 2 days. Each day the test job is loaded and executed on the Leica CD Testmask. The measurement jobs move the Testmask to the measurement positions and the CD-structure is measured automatically.
3. The measurements are carried out in the 0° and 90° orientation of the mask
4. Up to 14 CD structures (lines/spaces 0.3; 0.5; 0.7; 1.1; 2.2; 3.2; 4.6µm) are measured 30 times in a loop.
5. The results have to be stored in the database-window when the acceptance test run is finished
6. The database-file contains the calculated repeatability results. The 3 sigma value of all three days with 30 loops each are the ones.

Test Results

Serial No.: _____

System	Specification	Value	Acceptance Test Leica Wetzlar	Acceptance Test Customer site
Measurement system LWM				
Long term repeatability X i-Line (3sigma)		3nm	_____	_____
Long term repeatability Y i-Line (3sigma)		3nm	_____	_____
Signatures			Date: _____ Name: _____	Date: _____ Name: _____

Additional system tests and checks

Installation system tests

During installation procedure the following additional tests are carried out:

- Homogeneity check of illumination
- Stage repeatability

Please find an **Example** of these tests on the next pages! A print out or screen shot of the mask is carried out and completes this document!

System setup and configurations

During installation procedure the following system setup and configuration measures are carried out:

- LFS offset check
- Lens positions
- Configuration stage window
- Holder (position of center cross of test mask)
- Z-values of all objectives
- Config window

Please find an **Example** of these setup and configurations on the next pages! A print out or screen shot of the mask is carried out and completes this document!

Example Acceptance Test Protocol

To be prepared

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Example Screen homogeneity

To be prepared

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Example Stage repeatability

To be prepared

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Example LFS offs t check

To be prepared

Example Lens positions

To be prepared

Example Configurartion stage window

To be prepared

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Example Holder

To be prepared

Example Z-values

To be prepared

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Example Config window

To be prepared